DOCUMENT RESUME

ED 312 868 EC 221 327

AUTHOR Heiner, Donna; Ensign, Arselia S., Ed.
TITLE Computers for Vocational Purposes. PAM Repeater, No. 53.
INSTITUTION Physically Impaired Association of Michigan, Lansing. PAM Assistance Centre.
PUB DATE May 89
NOTE 13p.; Photographs will not reproduce well.
PUB TYPE Guides - Non-Classroom Use (055) -- Book/Product Reviews (072)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adults; *Assistive Devices (for Disabled); Computer Peripherals; *Computer System Design; Decision Making; Input Output Devices; *Microcomputers; *Physical Disabilities; *Selection

ABSTRACT

This pamphlet provides information on selection of a personal computer system for individuals with physical disabilities. It is directed toward adults or young adults who need to access such application programs as word processing, database management, and spreadsheets for higher education or vocational purposes. Following a brief description of what microcomputers can do, a comparison is presented of Macintosh and MS-DOS computers. A chart lists major input/output adapted features available for either the Macintosh or MS-DOS computers, such as voice recognition, optical head pointer, word prediction, and braille hard copy output. Peripheral equipment to be considered is also described, including printers, hard disk drives, color monitors, and memory options. In addition to consideration of the type of computer application and the adaptive hardware needed, performance level is identified as a decision-making factor. Three models each from Macintosh, IBM, and Zenith are categorized as Level 1, Level 2, and Level 3 in performance and their capabilities are described. (JDD)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED312868

PAM REPEATER

May, 1989

PIAM

PAM LLRC

No. 53

Computers for Vocational Purposes

Arselia S. Ensign, Editor
PAM Assistance Centre
601 W. Maple Street
Lansing, MI 48906
517-371-5897 or
1-800-274-7426

COMPUTER INFORMATION FOR INDIVIDUALS WITH PHYSICAL DISABILITIES

For any individual, the selection of a personal computer system involves a bewildering number of decisions. How much memory do I need? Is a color monitor a luxury or a necessity? What about a hard drive? Will I require a dot-matrix or laser printer? What kind of computer?

For an individual with a physical disability, the decision becomes even more complex. Some "options" are "necessities." Other factors enter in, such as the availability and compatibility of specialized input or output devices or specialized software.

This monograph provides individuals with a physical disability, some of the basic information required to navigate the decision maze. It is directed toward persons with at least a beginning level of computer literacy who require a computer for vocational purposes. The intended audience is therefore, adults or young adults who have progressed from a need to run educational programs to a need to access the more powerful application programs (word processing, database, spreadsheet, etc.) necessary for higher education or vocational purposes.

Portions of the monograph are courtesy of the University of Michigan Information Technology Division and appeared in "Computer Kickoff '88." Written by Margaret Wagner, Computer Systems Consultant, University of Michigan. Portions abstracted from the University of Michigan publication are italicized. Gregg Weiss, Microcomputer Sales Manager, Computer Center, assisted in the final proofing of the document.

Donna Heiner
Director
Living and Learning Resource Centre
Physically Impaired Association of Michigan

EC 221327

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Donna Heiner

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

SELECTING A COMPUTER FOR VOCATIONAL PURPOSES FOR INDIVIDUALS WITH PHYSICAL DISABILITIES

WHAT WILL A MICROCOMPUTER DO?

Most people recognize the advantages of using a microcomputer for writing and editing. But its capabilities extend far beyond word processing. For example, people are using microcomputers for such creative purposes as composing music, graphic design, choreography, brainstorming and organizing ideas, and creating artistic renderings.

Two of the greatest benefits of using a microcomputer are its abilities to speed up and simplify the performance of many tasks. Most of the applications for which microcomputers are used take advantage of this increased speed and simplicity. These include accounting, editing, and many types of information storage, organization, and retrieval, from organizing notes to searching large bibliographic databases. With appropriate software, microcomputers can also provide extensive mathematical capabilities.

Writing with a microcomputer goes well beyond using it simply for composing and editing. The microcomputer is a powerful instrument to aid in every step of the writing process, from the initial research and organization of ideas to the printing of finished copy. Outlining, editing, formatting, page layout, statistical charting, graphics, foreign-character typefaces, complex mathematical formulae, and high-quality printing can all be facilitated with a microcomputer and software.

For individuals with a physical disability, computers are the great equalizers. They provide the ability to compete, academically and vocationally. Computers, used with the appropriate hardware and software, can compensate for sensory or motor impairment. The physical disability falls into the background; what is important is what the individual knows, communicates, creates. How the individual accesses the computer becomes irrelevant compared to what is produced. Ability, not disability, is the crucial factor.

Throughout this document the abbreviations K, M, and RAM are used. K stands for Kilobyte, which is 1,024 bytes of storage. M is the abbreviation for Megabyte, which is 1,048,576 bytes of storage. Byte is the common unit of measurement for computer memory and storage. As a general rule, a double-spaced page of unformatted text requires approximately 2,000 bytes, or 2K. Therefore, a 720K disk drive has capacity for approximately 360 double-spaced pages of text.

RAM, which stands for Random Access Memory, is the memory, or temporary storage area, of a computer. Information on a disk is copied into RAM when it is needed for use by the computer's processor.

COMPARING THE MACINTOSHES AND MS-DOS (IBM AND ZENITH) COMPUTERS

In most cases, the choice of which computer to purchase begins with a decision between the Macintosh (Apple) series and MS-DOS computers (IBM and other companies).

The Apple Macintosh features a single coherent design, which includes a consistent user interface and hardware and software standardization. The graphical interface of the Macintosh makes it very easy for users, especially novices, to get started using the computer and to learn software packages.

MS-DOS microcomputers (IBMs, Zeniths, etc.), for the most part, use a character-based, command-mode interface, which some people find more difficult to learn. Each program typically has its own style of presenting information to the user, and each requires the user to learn processes for accomplishing tasks that may be different from the processes for accomplishing similar tasks in other programs.

A graphics-based user interface for MS-DOS computers (Microsoft Windows) is available, and MS-DOS program publishers are beginning to adopt this standard. MS-DOS software developers are not obligated to use a graphical user interface and currently a relatively small but growing number of applications take advantage of Microsoft Windows.

Overall there are a greater number of software packages for MS-DOS computers. The programs available for Macintoshes, however, are generally compatible in functionality to those for MS-DOS computers. For MS-DOS computers there is a wider range of software for statistical data analysis, database management, CAD/CAM (computer aided design/computer aided manufacturing), and local area networks. The Macintosh has a larger selection in the broad area of graphics. MS-DOS users have a wider range of hardware options from which to choose, especially expansion cards.

In some instances, it is not possible for the individual to choose computer types because the decision has already been made. For example, a college student majoring in a specific discipline may be required to learn a specific software application which runs on only one type of computer. In a vocational situation, it may be necessary for the individual to utilize a specific computer and application software compatible with that used by colleagues. The institution or company may use a large mainframe computer with which your personal computer must function as a terminal. For most personal computers, however, expansion cards and terminal emulation programs exist which permit access to a wide variety of mainframes.

The input or output method required by the individual also may limit the selection. There are many alternate input/output methods available on MS-DOS computer than on the Macintosh. However, the Macintosh features a number of built-in "easy access" features for individuals who can directly access the keyboard.

The following chart lists major alternate or input/output adapted features (either included or available commercially) for the Macintosh and MS-DOS Computers.

Input	Macintosh	MS-DOS
Keyguard	A	A
Braille	---	A
Voice Recognition	A	A
Scanning	A	A
Miniature Keyboard	A	A
Expanded Keyboard	A	A
Morse Code	A	A
Eye Gaze	---	A
Optical Head Pointer	A	A
Communication Device	A	A
Touch Screen	A	A
Ultrasonic	A	A
Joystick	A	A
Utilities		
Word Prediction/Anticipation	A	A
Abbreviation/Expansion	A	A
Spelling Checker	A	A
Defeat/Repeat	I	A
Macros	I/A	A
Key Latching	I	A
Keyboard Reconfiguration	I (Dvorak)/A	A
Output		
Large Print	A	A
Screen Enlargement	I/A	A
Braille Hard Copy Output	---	A
Braille Screen Review	---	A
Screen Review Voice Output	A	A
Tactile Screen Review	A	A
Other		
Laptop	A	A
Environmental Control	A	A
Augmentative/Alternative Communication	A	A

Key: I = Included A/? = Announced, to be released
A = Available --- = Not presently available

At the beginning of the selection process, you must answer the following questions:

1. Is there a specific computer type which I am required to use? If you are a college student, or a prospective college student, contact your academic advisor for additional information. If you have a vocation selected, investigate what others in similar job situations use. If you will be accessing a large mainframe computer, which personal computer can function as a terminal?

2. What kinds of application software will I use? Choices include: word processing, desktop publishing, drawing, CAD-CAM, statistics, spreadsheet, database.

3. What adapted input or output methods do I need to access the computer? You may have few or many options; you may need several options used singly or in combination for different tasks. The correct choice is not as simple as it may seem at first and usually requires consultation from consumers or professionals aware of the many possibilities. Individuals in Michigan may contact the Living and Learning Resource Centre for a consultation. Other Michigan resources include university or college special needs services, hospital-based rehabilitation centers, the Michigan Commission for the Blind, Michigan Rehabilitation Services, and a variety of disability-oriented consumer groups.

Other similar resources exist outside of the State of Michigan. Apple Computer (1-408-974-7910) will provide a listing of National Special Education Alliance (NSEA) sites throughout the United States. Although sponsored by Apple, these sites provide information on a variety of computer types and are knowledgeable about resources in their state. IBM operates a special needs hotline (1-800-IBM-2133) to answer questions about alternate access to IBM computers.

3. What Options will I need?

OPTIONS FOR CONSIDERATION

PRINTERS

Although the choice of printer is tied to the type of computer selected, both Macintosh and MS-DOS computers accommodate dot-matrix and laser printers.

Dot-matrix printers print in black and white. Some, with appropriate software and ribbons, also print in color. Most dot-matrix printers will allow printing in "draft" or "near letter quality mode," print text and graphics, and print single or multiple copies on letterhead, continuous paper, or labels.

Laser printers cost considerably more than dot-matrix printers and print high-quality (near-typeset) output. Laser printers are slower than dot-matrix and may require a hard drive.

With braille-translation software, it is possible to obtain Grade 2 braille output in either refreshable braille or hard copy braille.

HARD DRIVES

HARD DRIVES ARE USEFUL FOR:

- Applications requiring the use of two or more disks for the program, to avoid having to swap disks.

- Applications requiring frequent data storage or retrieval to and from disks.

- Creating and manipulating large files such as databases and long word processing documents.

- Handling and managing a large number of files and applications. A 20M hard drive is a storage device that can hold up to approximately 10,000 double-spaced unformatted text pages.

For anyone with a physical disability, a hard drive, or the ability to add a hard drive at a later date is a necessity, not an optional luxury. Because application software and data files can be saved on the hard drive, the need to insert and remove disks disappears. MS-DOS on computers, short programs called "batch files" can automate the loading of RAM-resident and application software. On the Macintosh, the same process can be accomplished through a macro program (Macromaker) which is included as a utility with the system.

A 20M hard drive holds the equivalent of 25 3.5" 800K disks. The speed of data retrieval and storage is much faster than floppy disk drives. Access time is measured in milliseconds.

MONITORS

Color monitors are used to enhance the interface of many applications. Though few applications actually require color monitors, some, including CAD/CAM applications, are much easier to use with a color, rather than monochrome, monitor.

A color monitor, when combined with software which utilizes its capabilities, may be of benefit to individuals with low vision or visual perceptual problems. Some word processing programs allow the user to alter screen and text colors to maximize contrast and visibility.

For some applications, a large screen display may be useful. Many, however, do not do an adequate job of enlarging text.

MEMORY OPTIONS

As previously stated, RAM (Random Access memory) is the temporary storage area of a computer. Except for the Zenith Supersport, which has 640K RAM, all the computers reviewed feature at least 1M RAM.

Application programs are becoming increasingly sophisticated. As a result, they have become larger and require more memory.

To use a computer efficiently and effectively, most individuals with physical disabilities require specialized utility programs (referred to as "memory resident, RAM-resident," programs). These programs must be loaded into the working temporary memory (RAM) of the computer before the application program is loaded.

In order to meet the memory requirements of RAM-resident programs, application programs, and the individual's data files, at least 640K RAM is necessary.

WHICH MODELS SHOULD I CONSIDER?

Once you have narrowed your selection to the type of computer (Macintosh or MS-DOS), there are still decisions to make regarding the specific computer model. As the following illustrates, the choice of model will depend in large part on the type of application for which the computer is being purchased.

However, if an individual requires adaptive hardware for information input or output, that hardware must also be compatible with the computer model. All MS-DOS, all IBM PS/2, or all Macintosh computers ARE NOT THE SAME, especially with non-standard adaptations. Before you purchase, talk to the vendor and ask which models the equipment functions on. Don't purchase the equipment until you have seen the adaptation work on that computer model!

In its "Kickoff '88 Computer" brochure, the University of Michigan Information Technology Division divided the computers available for purchase into three *performance levels: Level 1, Level 2, and Level 3.*

The Level 1 microcomputers can be used for a wide variety of applications. They are adequate for those who will be using their microcomputers primarily for word processing and telecommunications, as well as for many other applications. These microcomputers are not the best choice for people who will be using software that requires particularly fast processing speeds and very large storage capacities.

Laptop computers are easily transported and a laptop is worth considering if you plan on moving your computer often or if you need a computer that can optionally run on batteries. Note that because the laptop is small and lightweight, it can easily be removed and concealed, and is therefore more susceptible to theft. While the portability of a laptop is an otherwise attractive feature, this should be weighed against its non-standard keyboard and liquid crystal display, which, although quite readable, is not as bright and clear as a desktop display. Some programs that require high-resolution graphics capabilities may not work with the laptop's display.

An individual who will need to use a computer in class, for communication or note-taking purposes, or at different locations, will require a portable laptop system. For wheelchair users, there are a variety of mounting systems which fasten the computer to the chair frame in the optimum position.

The Level 2 microcomputers are a good choice for people who plan to use applications that require increased speed. With a hard disk these systems are adequate for many database and spreadsheet applications. For those who wish to use hardware add-ons, the Level 2 microcomputers each provide one or more expansion slots.

The Level 3 microcomputers are powerful systems that will appeal to a limited number of microcomputer users. The greatly increased processing speed and storage capacity of these microcomputers make them most appropriate for applications such as software development, manipulation of very large databases, and applications that require extensive, high-speed mathematical capabilities, such as those in some research applications.

	Apple	IBM	Zenith
Level 1	*Mac Plus*	*PS/2 Model 30 (laptop)*	*SupersPort*
Level 2	*Mac SE*	*PS/2 Model 50 Z*	*Z-286 LP*
Level 3	*Mac II*	*PS/2 Model 70*	*Z-386*

The above computers are included because they are the computers most frequently considered by individuals with physical disabilities and because they are widely available. PS/2 models can be purchased at a considerable discount through the IBM-Easter Seals program. (Call 1-800-2133 for additional information.) Their inclusion does not constitute a recommendation or signify that these computers are superior to those of other manufacturers.

In addition, many companies manufacture MS-DOS compatible computers. These companies include: Compaq, Tandy, Zenith Data Systems, Wyse Technology, Epson America Hewlett-Packard, NEC, AST Research, and Ing. C. Olivetti.

LEVEL 1 - MACINTOSH PLUS

The Macintosh Plus is the basic Macintosh offered by Apple Computer. It can be used for a wide variety of applications. It features a built-in screen (A monochrome) with a keyboard, a mouse, and 1M RAM. It has a single internal floppy 800K disk drive and an optional 800K disk drive or 20M external hard drive, and 3.5" double-sided diskettes. It also has a high-speed peripheral connector called the SCSI port, to which peripheral devices can be daisy-chained. The 20M SCSI Hard Drive is equivalent to 25, 3.5" 800K disks. Its speed of data retrieval and storage is much faster than floppy disk drives. The average seek time of this hard drive is 30 milliseconds. The Macintosh Plus includes serial, mouse, printer, and SCSI ports, and the Macintosh operating system.

Level 1 - Macintosh Plus

Level 2 - Macintosh SE

Level 3 - Macintosh II

LEVEL 2 - MACINTOSH SE

The Macintosh SE is the same as the Macintosh Plus with the exception of the following:

- includes two internal 800K floppy drives or, optionally, one internal 800K floppy drive and one internal 20M hard drive

- includes one internal slot for expansion cards such as network cards, internal modems, coprocessor cards, and cards for driving large external monitors and displays

- includes Apple standard keyboard

- runs faster--according to Apple, approximately 15% faster

- includes a port in the keyboard called the Apple DeskTop Bus, which is a peripheral bus that provides the capability to connect up to 16 input devices concurrently (such as keyboards, mice, graphics tablets, light pens, etc.).

LEVEL 3 - MACINTOSH II

The Macintosh II is the most powerful computer in Apple's Macintosh line. It has a 32-bit 68020 microprocessor and a 68881 floating-point coprocessor, which allows it to run most applications, according to Apple, up to four times faster than the Macintosh Plus. The Macintosh II has six high-performance, 32-bit, NuBus internal expansion slots which accommodate an increasing variety of cards, including cards designed to allow it to run MS-DOS applications. It has a high-speed external SCSI port and an advanced sound chip that can play digitized sound in stereo with sampling rates comparable to those of audio compact discs. It has a 12" color monitor with a resolution of 640 x 480 pixels. A 1-bit/8-bit Macintosh II Video Card allows the color monitor to display up to 256 colors from a palette of over 256,000.

LEVEL 1 - IBM PS/2 MODEL 30

The IBM PS/2 Model 30 is the second level computer of the IBM PS/2 line of microcomputers. It is similar to the IBM PC/XT but it is smaller (see chart in this booklet) and has faster processing speed (according to IBM, it runs about 2.5 times faster than the IBM PC/XT). It is compatible with virtually all software written for IBM PCs and PC/XTs. The most common configuration includes a Model 30 1M 640K RAM, one 3.5" diskette drive, and one 20M internal hard disk drive.

This model comes with a 12.4" IBM Personal System/2 monochrome display, a mouse, three available expansion slots, and serial, parallel, and mouse ports.

LEVEL 2 - IBM PS/2 MODEL 50 Z

The Model 50 Z is an 80286-based microcomputer incorporating IBM's Micro Channel Architecture and VGA video adapter with 640 x 480 pixels resolution, which allows the color monitor to display up to 256 colors from a palette of over 256,000. It is smaller than an AT (see chart in this booklet), and has one 3.5" 1.4M floppy drive and one 30M hard disk drive. The Model 50Z has 1M of RAM, which can be expanded to 2M on the system board. The Model 50 Z has new high-speed memory and a faster access hard disk (39 millisecond average seek time) for improved performance, up to 35% faster processing than the original Model 50. It comes with the IBM 101-key extended keyboard, the most current version of PC-DOS, a mouse, three available expansion slots, and serial, parallel, and mouse ports. With additional memory added, the Model 50 Z is capable of running Operating System/2 (OS/2). The Model 8513 12.3" high-resolution color monitor is available.

LEVEL 3 - IBM PS/2 MODEL 70

The IBM Model 70 is the top level computer of the PS/2 line of microcomputers. The Model 70 uses an 80386 microprocessor, and includes one 3.5" 1.4M floppy disk drive, a 60M hard disk drive (27 millisecond average seek time), and the IBM 101-key extended keyboard. The Model 70 has 1M of RAM, which is expandable to 6M on the system board. The memory can be expanded to a maximum of 16M. The Model 70 has the same size footprint as the Model 50 Z (see chart in this booklet). Standard features include VGA video with 640 x 480 pixels resolution, which allows the color monitor to display up to 256 colors from a palette of over 256,000, Micro Channel architecture, a mouse, three available expansion slots, and serial, parallel, and mouse ports. With additional memory added, the Model 70 is capable of running Operating System/2 (OS/2) and Presentation Manager. A Model 8513 12.3" high-resolution color monitor is available with the Model 70.

LEVEL 1 - ZENITH SUPERSPORT LAPTOP

The Zenith SupersPort is also a faster IBM PC/XT-compatible microcomputer. The SupersPort is a self-contained laptop computer that weighs between 10 and 15 lbs., depending on the configuration. It has an LCD display (CGA video, 640 x 200 pixel resolution), 640 K RAM, parallel and serial ports, connector for an expansion bus, and connectors for an external RGB monitor and a keyboard or keypad. The model may be purchased with two 3.5" 720K floppy disk drives or, optionally, one 3.5" floppy drive and one 20M internal hard drive.

LEVEL 2 - ZENITH Z-286 LP

The Z-286 LP is an AT-compatible, 80286-based microcomputer. It is smaller than the AT (see chart in this booklet), has the IBM 101-key extended keyboard, and uses VGA video with 640 x 480 pixels resolution, which allows the color monitor to display up to 256 colors from a palette of over 256,000. The Z-286 LP includes 1M internal memory. This model comes with one 3.5" 1.4M floppy drive and a 20M internal hard drive (65 millisecond average seek time), a mouse, two available expansion slots, and serial and parallel ports.

With additional memory added, the Z-286 LP is capable of running Operating System/2 (OS/2). A 14" FTM color analog monitor is available. The FTM ("flat tension mask") monitor has a flat video display which virtually eliminates glare and edge distortion.

LEVEL 3 - ZENITH Z-386

The Zenith Z-386 is a high-performance addition to Zenith's IBM-compatible series. It features Intel's 80386 32-bit microprocessor. According to Zenith, the Z-386 runs 2-3 times faster than AT-compatible microcomputers. This model comes with 1M internal memory, a 40M internal hard drive (28 millisecond average seek time), one 3 1/2" 1.4M floppy diskette drive, one 5 1/4" 1.2M floppy diskette drive, a mouse, five available expansions slots, and serial, parallel, and mouse ports. With additional memory added, the Z-386 is capable of running Operating System/2 (OS/2). It also includes a VGA video adapter with 640 x 480 pixels resolution, which allows the color monitor to display up to 256 colors from a palette of over 256,000. A 14" FTM color analog monitor is available. The FTM ("flat tension mask") monitor has a flat video display which virtually eliminates glare and edge distortion.

--Photo by Donna Heiner

--Photo by Donna Heiner

PAM Assistance Centre
601 West Maple Street
Lansing, MI 48906

Non-Profit Org.
U.S. Postage
PAID
LANSING, MI
PERMIT No. 788